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Business Growth in an Era of Water Scarcity

6 May 2015

Webinar Agenda

▲ Welcome – NAM Moderator

▲ Topic: Business Growth in an Era of Water Scarcity

- Webinar attendees will learn why water scarcity is a threat to business growth, how water scarcity is impacting operations, how regulators are responding, strategies to overcome water scarcity constraints, how to account for the full value of water using tools like the Water Risk Monetizer, and how to use that information to inform business decisions that enable sustainable business growth.

▲ Speakers:

- Emilio Tenuta, Vice President of Corporate Sustainability, Ecolab
- Snehal Desai, Global Business Director, Dow Water & Process Solutions, The Dow Chemical Company
- Peter Adriaens, PhD PE BCEEM, Professor of Environmental Engineering & Finance; Professor of Entrepreneurship & Strategy (Ross School of Business), The University of Michigan - Ann Arbor



'Lake' Oroville, CA

Business Water Risk

Peter Adriaens, PhD PE BCEEM
 Professor of Environmental Engineering,
 Entrepreneurship & Finance
 The University of Michigan
 Ann Arbor, MI 48116

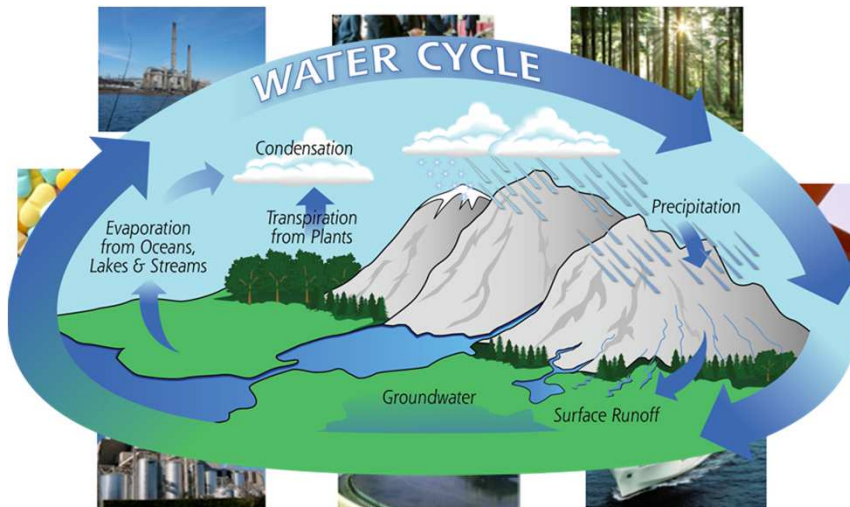
DATA DROUGHT

Informing a new era of water management

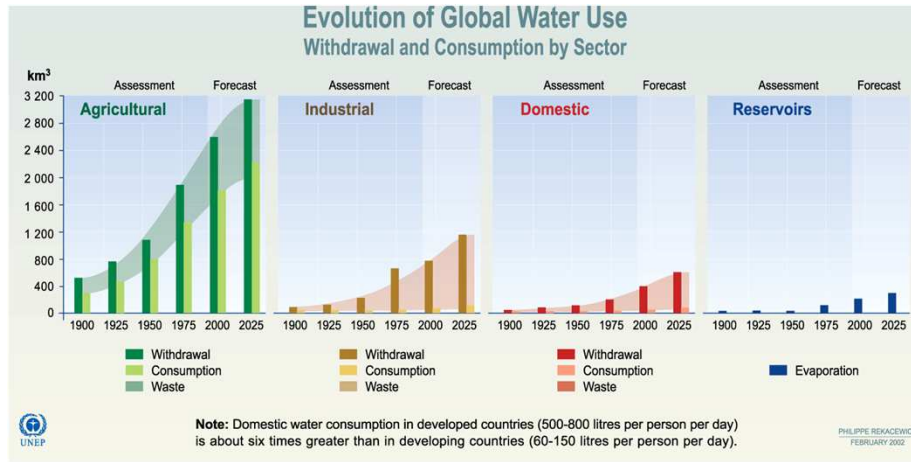
For a species that prides itself on scientific discovery, we know startlingly little about the resource that is most crucial to our survival and business operations

water

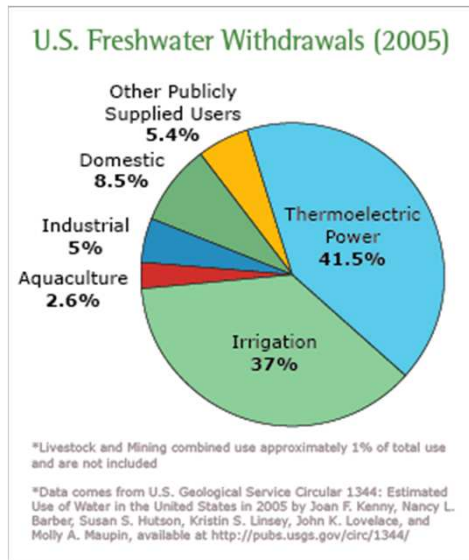
The Water Cycle and Commerce

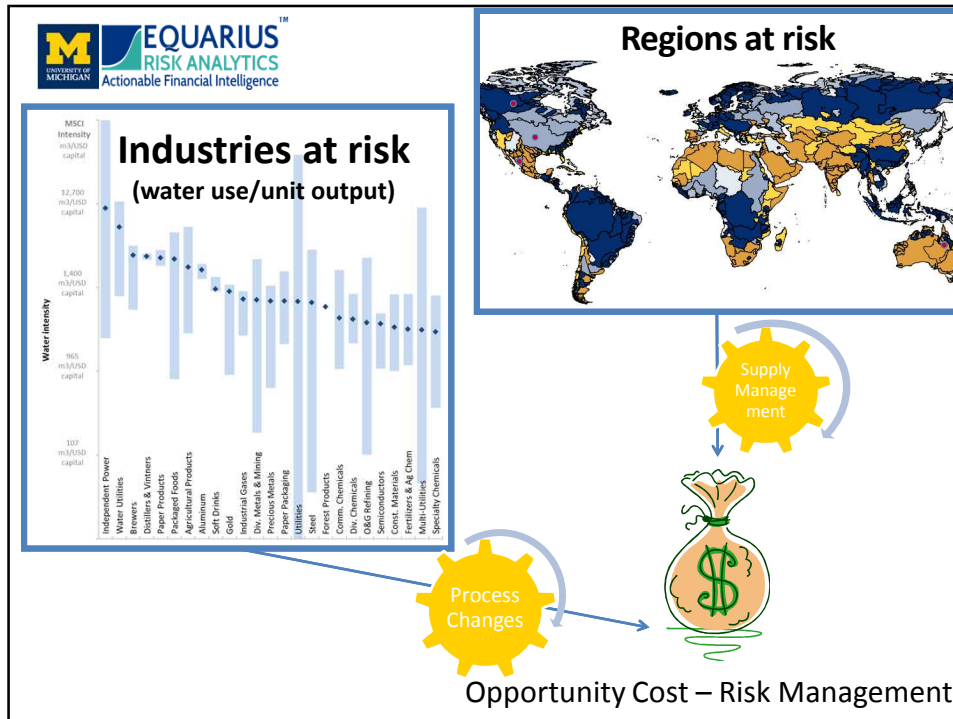


Global Trends



Water Use in the US by Sector





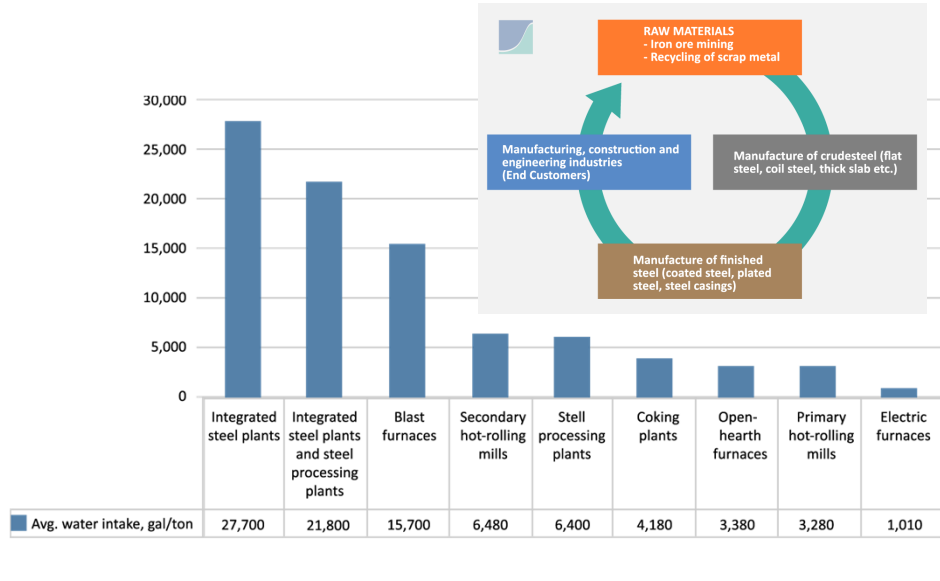
Water Risk Leads to Revenue Risk: Valuing the Opportunity Cost

Electric Utilities	Gold	Steel
<ul style="list-style-type: none"> USD 21 billion in electricity sales at risk 6% of total sales 	<ul style="list-style-type: none"> USD 221 billion in gold reserves at risk 10% of total reserve value 	<ul style="list-style-type: none"> USD 17 billion in steel sales at risk 3% of total sales

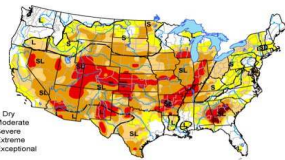
Water Risk → Revenue Risk → Equity Volatility Risk

MSCI ESG Research

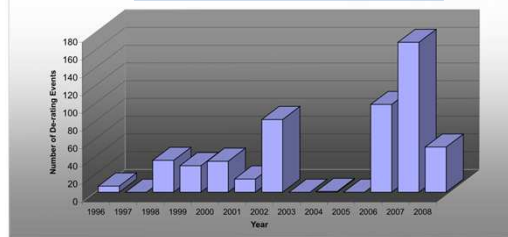
How Exposed is Your Company to Water?



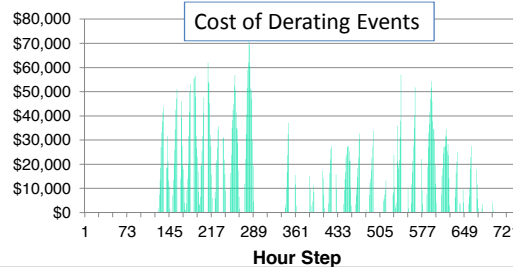
Operational Water Risk Impacts: Electric Utility Example



Frequency of Derating Events



Cost of Derating Events



Key Takeaways

1. Business water risk is the result of imbalances in the water cycle, and increasing demands for business growth
2. The risk impacts revenue, opportunity cost, and market volatility of the company's stock
3. The water risk exposures are unequally distributed by region, industry type, and your company's activities
4. Understanding your exposure, and being able to properly value the associated financial risk with respect to operations and capital markets aids in selecting appropriate risk management strategies.
5. Since extreme events are here to stay, water risk management strategies have risen to the executive corporate office.



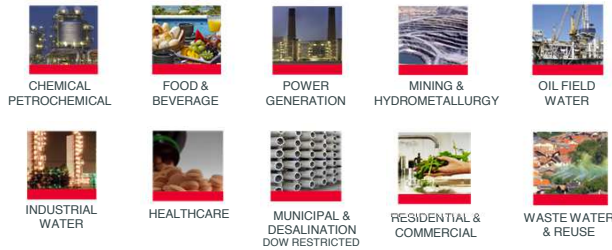
Dow Water & Process Solutions

2015

The Dow Chemical Company

Water and Process technologies and markets

The most complete portfolio in the industry today and a global presence second to none with #1 positions in reverse osmosis and ion exchange



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Industrial Oil & Gas

Neptune Water Treatment Facility (Moneta Divide, Wyoming)

DOWEX™ OPTIPORE polymeric adsorbent technology helps enable the treatment of flowback and produced water from fracking operations at Moneta Divide by removing boron and other harmful organic compounds

NEPTUNE WATER TREATMENT FACILITY

90%
RECOVERY

900,000 GALLONS
(22,500 BPD) OF
CLEAN WATER A DAY
OR MORE THAN ONE
OLYMPIC SIZE
SWIMMING POOL

10%
WASTEWATER

100,000 GALLONS
(2,500 BPD)
CONCENTRATED BRINE

750 GALLONS
PER MINUTE

3rd WATER TREATMENT
FACILITY
— OF ITS KIND —
LARGEST IN THE WORLD

CAN TREAT
UP TO
1 MILLION
GALLONS
OF
PRODUCED
WATER
A DAY



DOW RESTRICTED

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Power



Power station for a major brewer in North America

Using DOW FILMTEC™ ECO, the brewery has:

- Helped ensure **uninterrupted beer production**
- Helped **reduce the energy** required to treat boiler feed make-up water
- reduced its energy by **10-20 percent**

Power station in Canada

Designed a two-pass RO system with FILMTEC™ ECO which resulted in **30 percent more energy savings** in the system's second pass and improved overall pressure drops and fouling.

Food & Beverage

Large brewery in California

- A pilot demonstrated the ability to **reduce TSS by 60 to 80%** from 800 mg/L, **saving the brewer \$300** in surcharges per pound of solids removed

Pork processing plant in Oklahoma

- Demonstrated that it can **save \$180,000/year** in chemical costs
- **60% reduction** in chemical costs
- Completely replace the DAF in the future with the self-cleaning filter

Beef processing plant in Texas

- Potential to **save \$250,000/year** on its water utility bill
- In a recent pilot, the filter successfully **removed particles greater than 30 microns**

Pork processing plant in Kansas

- Notably **reduced costs** and **improved the capacity** of its wastewater reuse system
- Utilizing the self-cleaning filter after a DAF to protect bag filters in addition to an UF filter
- TSS was **reduced by 60%** from the DAF effluent with water recovery **greater than 99%**




DOW RESTRICTED 18

$$x^2 + 3(c) + ab \quad f(x) [a+b] + v_i \quad \sqrt{ab} (c) x^2 + 3$$

$$f = -0.5z^2 \frac{\sqrt{I}}{\sqrt{I+1}} \quad 3 + f(x) + v_i \quad k = \frac{[NH_3]^2}{[N_2][CH_2]^3}$$

$$\ominus + [a] 7x + 3 \quad 5x^2 + a(b) + v_i \quad sb + [a] + (c) x^3$$

ASSESSING RISK & INFORMING BETTER WATER MANAGEMENT DECISIONS

Emilio Tenuta
Vice President, Corporate Sustainability



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Ecolab serves the needs of diverse industries with the help of 25,000 onsite experts



WATER & ENERGY MANAGEMENT

ANTIMICROBIAL TECHNOLOGIES


EQUIPMENT DISPENSING AND MONITORING


SUSTAINABLE SOLUTIONS





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WATER SCARCITY IMPACTS TO BUSINESS

 Nearly **2 billion people** live where access to clean and safe water is increasingly limited

 By 2030, there will be a **40% gap between water supply and demand**

 In 2014, the global water crisis rose to a **top-three business risk** for impact and likelihood

 **70% of companies surveyed** identify water as a substantive business risk

US-based Fortune 500 companies:

94% face potential physical challenges

69% face reputational risks

80% say it will affect their decisions on where to locate facilities

60% indicate water will affect business growth and profitability within five years

SOURCES: World Economic Forum
2013 CDP Water Report
Bridging Concern with Action: Are US Companies Prepared for Looming Water Challenges?, Pacific Institute and VOX Global 2014 survey of US-based Fortune 500 companies

WATER IS A CONSTRAINT TO GROWTH

WATER SCARCITY PUTS MOST OF THE WORLD'S BIGGEST ECONOMIES AT RISK



Source: Water Risk Monetizer
Developed by Ecolab & Trucost



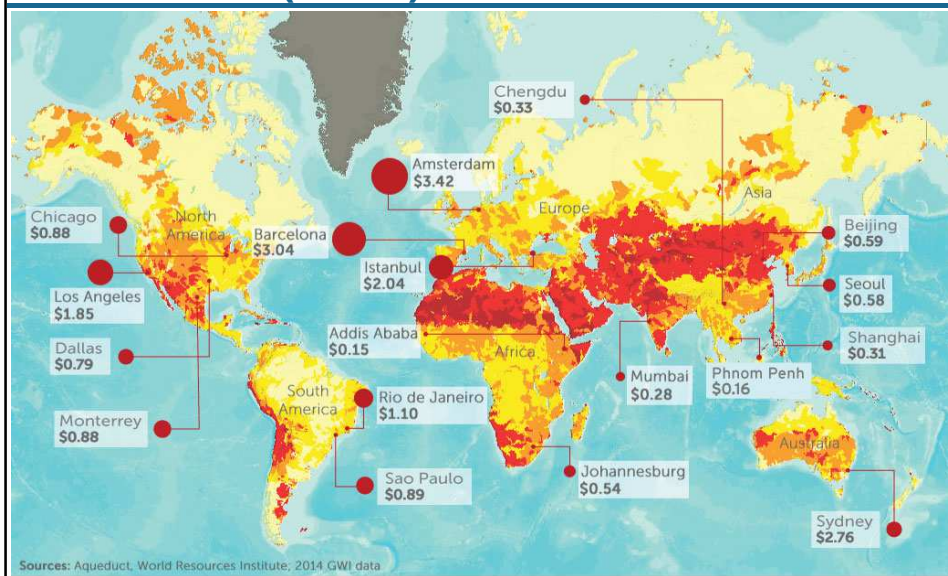
WE NEED TO SHIFT OUR BEHAVIOR

Challenges for Change

- Water is inexpensive
- Not yet personal
- Difficulty making the business case



WATER PRICES INVERSE TO SCARCITY (RISK)





WATER RISK MONETIZER

Informing better business decisions.

ECOLAB



WATER RISK MONETIZER

A **financial modeling tool** that provides a new way for businesses to incorporate water risks into business decisions by helping businesses understand the full value of water to their operations.

First-of-its-kind

Publicly available

No cost

By **quantifying water-related risks in financial terms**, the tool bridges the gap between today's low market price for water and the water risks that affect businesses around the world.

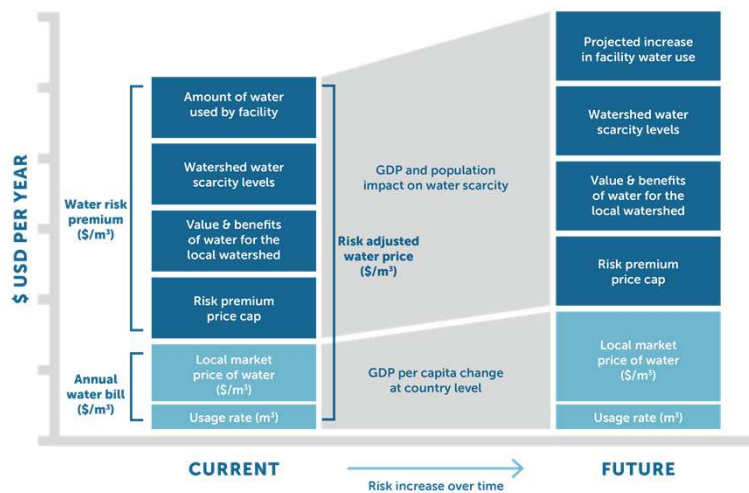
The result is actionable information that **supports business growth** and helps ensure the **availability of this limited natural resource for future generations**.



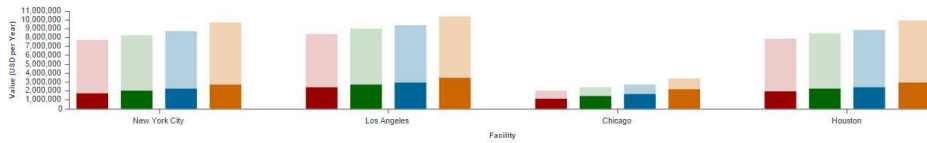
Financial information to inform business decisions:

- 1 **Current and future water bill:** Forecasted water costs based on the historical relationship between country level GDP and water price.
- 2 **Water risk premium:** An estimate of the financial value of water if it were priced according to market principles of supply and demand at a particular location. The premium considers the risks associated with a facility's ability to access the water it needs from the local watershed and the implications of that water use on the community.
- 3 **Risk-adjusted water price:** Forecasted water bill plus water risk premium represents the value that should be placed on water based on real and future risk related to water scarcity.

Making it easier to factor the potential cost or impact of water risks into business decisions in the same way other risks are considered in planning and capital allocation.



EXAMPLE: Steel Plants



■ Year 1 Water Risk
 ■ Year 3 Water Risk
 ■ Year 5 Water Risk
 ■ Year 10 Water Risk
■ Year 1 Water Bill
 ■ Year 3 Water Bill
 ■ Year 5 Water Bill
 ■ Year 10 Water Bill

Facilities List												
Facility Name	Country	City	Amount of Water Used (m ³ per year)	Water In Price (USD per m ³)	Projected Water Use over 3 Years (%)	Year 1 Annual Water Bill (USD per year)	Year 1 Water Risk Premium (USD per year)	Year 1 Total (USD per year)	Year 1 Risk Adjusted Water Price (USD per m ³)	Year 1 Risk Adjusted Water Price (USD per Facility Output)	Water Scarcity Risk Score	Regulatory Risk Score
New York ...	United States	Manhattan	1,330,188	1.31	0	1,742,546	5,960,404	7,702,950	5.79	3.08	HIGH	MODERATE
Los Angeles	United States	Los Angel ...	1,330,188	1.85	0	2,460,848	5,960,404	8,421,252	6.33	3.37	HIGH	MODERATE
Chicago	United States	Chicago	1,330,188	0.88	0	1,170,566	888,354	2,058,920	1.55	0.82	LOW	MODERATE
Houston	United States	Houston	1,330,188	1.46	0	1,942,075	5,960,404	7,902,479	5.94	3.16	HIGH	MODERATE

www.waterriskmonetizer.com

Businesses can use the Water Risk Monetizer to:

- **Incorporate** a risk-adjusted cost of water into a facility budget, financial projections, business scenarios, project proposals, etc.
- **Make the case** for proactive water management strategies (solutions, technologies, programs, etc.)
- **Identify** operations/locations at greatest risk
- **Monetize** rate of return for water management improvement projects
- **Select** where and how to increase production or meet demand in new regions



WATER RISK MONETIZER

WaterRiskMonetizer.com

The screenshot displays the website's homepage with a navigation menu (Home, Water Risk Monetizer, About, Resources, Contact) and a main banner featuring a world map and the text "Informing better business decisions." Below the banner is a section titled "THE MONETIZATION OF RISK" with two columns of text. To the right, a document titled "WATER RISK MONETIZER METHODOLOGY" is shown, containing a table of contents.

THE MONETIZATION OF RISK

Water scarcity is a constraint to growth for businesses around the world. Challenges accessing the water businesses need, in the places they need it, with regard for others who share it, threaten business vitality across industries and geographies.

Despite these real and future risks, water is significantly undervalued in much of the world. The disconnect between market price and risk makes it hard to support optimal decisions regarding where to locate and expand operations or prioritize investment in water strategies.

WATER RISK MONETIZER METHODOLOGY

CONTENTS

- Content
- Introducing the Water Risk Monetizer
- Methodology
- Water use
- Water price
- Adjusted water use over 3 years
- Annual water use
- One-time fixed costs
- Water bill scenario model
- Water use projection
- Water scarcity scenario model
- Water risk scenario cost
- Total water risk
- Water risk portfolio optimization software
- Key inputs
- Regulatory risk score
- Applicable water risk score
- Water scarcity risk score
- Appendix: Data sources

QUESTIONS?

